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TURNABOUT ON CONSCIOUSNESS: A MENTALIST VIEW

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Author Note

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ABSTRACT

Conceptual foundations for the changeover from behaviorism to mentalism are reviewed in an effort to better clarify frequently contested and misinterpreted features. The new mentalist tenets which I continue to support have been differently conceived to be a form of dualism, mind-brain identity theory, functionalism, nonreductive physical monism, dualist interactionism, emergent interactionism, and various other things. This diversity and contradiction are attributed to the fact that the new mentalist paradigm is a distinctly new position that fails to fit traditional philosophic dichotomies. Formerly opposed features from previous polar alternatives become merged into a novel unifying synthesis, an unambiguous description of which demands redefinition of old terms or/and the invention of new terminology. The present analysis and interpretation are backed by statements from the early papers.

TURNABOUT ON CONSCIOUSNESS: A MENTALIST VIEW

My earlier writings on consciousness in which the mind is placed in an emergent causal role have been reported to be notably confusing by a number of authorities (e.g., Bindra, 1970; Churchland, 1986; Natsoulas, 1987; Ripley, 1984; Rottschaefer, 1987; Savage, 1976; Smart, 1981). Though correctly interpreted in some cases (e.g., Dewan, 1976; Grenander, 1983; Natsoulas, 1987; Ripley, 1984; Rottschaefer, 1987; Slaatte, 1968, 1981; Trevarthen, 1990; Weimer, 1977; Wimsatt, 1976) these writings have also, almost equally often, been misinterpreted in a number of ways (e.g., Bunge, 1980; Hebb, 1980; MacKay, 1984; Popper and Eccles, 1977; Puccetti and Dykes, 1978; Smart, 1981; Uttal, 1978; Weimer, 1976). The position I support as "mentalism," "emergent mentalism" or just the "new mentalism" has been variously interpreted to be "dualism," a "mind-brain identity" view, "functionalism," "physical monism," "mentalist monism," "emergent mentalism," "emergent materialism," and "dualist interactionism" -- among other things.

Such extraordinary confusion, still evident after more than 20 years (Churchland, 1986; Lamal, 1990; Natsoulas 1987; Peterson, 1990; Pirolli and Goel, 1990; Pribram, 1987), may reflect a lack of clarity in my thinking and/or writing or, in part, my attempt to avoid specialized terminology in initial presentations to a broad general audience. Primarily, however, I believe it can be attributed to the nature of the mind-brain position itself, as pointed out also by Natsoulas (1987) and more emphatically by Ripley (1984). The position is one which departs from previously accepted conceptual dichotomies in philosophy. As Natsoulas (1987, p. 1) states, it "blends together features of opposed solutions."

Traditionally conflicting positions on mind and matter, the mental versus the material, are integrated in a new middle-ground view for which standard philosophic terms must be given new meaning or new terms invented. Ripley (1984, p. 419) faults me for "failure to recognize the need to redefine terms carefully in order to give a clear presentation of a radically novel theory." The terminology itself, as well as the actual concepts, becomes a source of misinterpretation. Contributing further to the problem, the supporting arguments are presented in a widely scattered literature spanning several decades, some of the papers no longer readily

accessible. What follows is an effort to update and better clarify the theory by bringing together in a single listing some of the more contested and troublesome defining features as these have surfaced over time, along with a few comparisons to related contemporary views.

It will be helpful to make clear in advance that the following arguments for conceiving consciousness as a causal emergent in brain function are taken to apply as well to the new mentalist paradigm that recently has replaced behaviorist doctrine in psychology. The abrupt mentalist overthrow of the half century-old, seemingly impregnable behaviorist paradigm (Baars, 1986; Gardner, 1985; Sperry, 1987) with its secure basis in foundational tenets consistent with the other sciences, is hardly likely to have been achieved within a few years on different grounds via two dissimilar mentalist theories.

In weighing the issues that follow we thus deal with more than mere personal opinion and the growing myriad of individual differences in the philosophy of consciousness. As a result of the consciousness revolution of the early 1970s in mainstream psychology (Dember, 1974; Matson, 1971; Palermo, 1971; Pylyshyn, 1973) it has become a paradigm conflict between different disciplines over what to use as the basic working conceptual framework for science. At stake is the question of what is valid in causal explanation.

On the one side, behavioral and cognitive science lead the way for a new ***macromental*** paradigm affirming downward (top-down) causal control by irreducible emergent macro properties over their component parts, a special instance of which is the downward control by ***mental*** events over the lower neuronal events. On the other side the more exact basic sciences continue predominantly to adhere to traditional microdeterminist, exclusive "bottom-up" determination of the whole by the parts, in which the neuronal events determine the mental but not vice versa.

Essentially it translates into a conflict in the history of science over the kinds of forces claimed to control ourselves and the world. While the outcome should little affect the methodological approach or the actual day-to-day practice of science, it could vastly transform the kind of worldview science leads us to believe in, the relationship of science to values, and the type of causal explanation and understanding used in science and elsewhere.

Rather than attempt to list the various debated points in an order of seeming importance or in other logical sequence, I have

simply taken them up in roughly the chronological order of their appearance, hoping the collective total will piece together into a consistent and reasonably complete picture. It is assumed that the reader already has a moderate knowledge of mind-brain issues and terminology. To avoid undue repetition, reference citations for my own prior descriptions, where evident, include only date and page numbers.

The New Mentalism is A "Functionalist" Interpretation

> Subjective meaning depends on the over-all functional effects of the physiological processes, not upon their copying or representing in code form the attributes of the stimulus. (Sperry, 1952, p. 308)
>
> The central excitation may vary considerably in its geometric, spatiotemporal and other properties while maintaining invariant or equivalent functional value...the same psychic meaning ***may*** be obtained from brain patterns the neuronal details of which differ considerably on different occasions. Not only may different neurons be involved, as many configurationists (e.g., Gestaltists) would agree, but more than this, the configuration of neurons may vary. (p. 309)
>
> Significance and meaning in brain function do not derive from the intrinsic protoplasmic or other analytic aspects of neural excitation, but rather from their higher-order functional and operational effects as these work upon successive brain states... . We should not expect to find that a single neuron or an isolated patch of neurons, or even a cortical center, could sense, feel, experience, or think anything in isolation. (pp. 310-311)

This "functional" approach has been developed extensively in recent years by Fodor (1981) and others, to become the central philosophy of the new computer oriented cognitive science and is thought of as a philosophic development of the late twentieth century (Boden, 1988). In the above early statement, it was not conceived in an abstract restrictive computational or linguistic sense, but in more generalized terms that apply also to consciousness and emotion in the still-to-be elucidated codes of brain processing.

This 1952 predication that subjective meaning derives from the overall ***functional*** effects of the physiological processes may be seen now as tantamount to saying that subjective qualities have causal functional influence. However, in the early 1950s our mind-sets were still strongly behaviorist in principle and the mentalist implications were not seen until some years later.

Monism, Not Dualism

In responding to claims that the view I present is dualism (Bindra, 1970; Bunge, 1980; Puccetti, 1977), I explained at some length, under the titles "Mentalist Monism" (1978) and "Mentalism, Yes; Dualism, No" (1980), why this theory is not dualistic in the classic sense, but rather a new form of monism that conceives mental entities in an emergent and causal role. In this view conscious experience, taken to be a nonreductive dynamic emergent of brain activity, cannot exist apart from the brain. There is no provision for unembodied consciousness, mind, or spirit. The early statements seemed explicit.

> The present scheme would...eliminate the old dualistic confusions, the dichotomies and the paradoxes, proposing instead a single unified system.... (Sperry, 1965, p. 85)
>
> ...this represents a return toward mentalism except that the mental forces are not viewed in any metaphysical, preternatural, nonmaterial, epiphenomenal, or other dualistic sense. (1970a, p. 588)
>
> The term [mental forces] fits the phenomena of subjective experience but does not imply here any disembodied supernatural forces independent of the brain mechanism. The mental forces as here conceived are inseparably tied to the cerebral structure and its functional organization. (1970b, p. 137)

The term ***mentalism*** is used throughout as in behavioral science to imply that behavior is ***mentally*** driven (in contradiction to behaviorist doctrine) and not, as in occasional philosophic usage, to imply that the physical world has reality only insofar as it is perceived mentally.

Long-Banned Mental States are Made Legitimate for Science

The accepted basic assumption of materialist science that "mind does not move matter" (Herrick, 1956, p. 281), that "no physical action waits on anything but another physical action" (MacKay, 1966, p. 438), or in neuroscience, that "as neurophysiologists we simply have no use for consciousness...to explain how the nervous system works" (Eccles, 1966, p. 250) was contradicted and reversed. The traditional logic of causal explanation which we had previously assumed to be airtight and irrefutable was discovered to have an oversight or loophole allowing for a different form of causal determinism by which mental properties could be seen to have a supervenient form of objective causal control from above downward over the lower level neuronal events. Unlike previous approaches that had tried to insert the conscious effects into the causal matrix already described in neurophysiology, a new approach was used that preserved the micro physiology but embedded it within a (yet to be described) higher-level system that involves causal interaction of cognitive processes.

> ...the causal potency of an idea, or an ideal, becomes just as real as that of a molecule, a cell, or a nerve impulse. (Sperry, 1965, p. 82)

> ...the interplay of psychic and mental forces, though accessible -- like the interior of the earth -- only indirectly at this date becomes, in principle, a proper phenomenon for scientific investigation. (p. 83)

> The present scheme would put mind back into the brain of objective science and in a position of top command. (p. 85)

> ...with the critical interjection of these mental qualities into the causal sequence. Note that we have not rejected the objective approach of science; it is an objective explanatory model.... (p. 85)

> Instead of being parallelistic and noninterventionist, consciousness in the present scheme becomes an integral part of the brain process itself and an essential and potent

> constituent of the action. Consciousness is put to work and given a use and a reason for having been evolved. (1969a, p. 230)

Brain and Mind Are Different, Not Identical

In contrast to mind-brain identity theory, the conventional differences between mind and brain are accepted and emphasized. The brain process consisting of a multilevel hierarchic compound of entities and events from subatomic up through cerebral circuit and cognitive levels, is composed mostly of nonconscious elements that are common both to conscious and unconscious brain processes. Only upper levels within certain particular brain processes are presumed to sustain conscious qualities. The brain process and the conscious properties are inseparable but different. The difference between mind and brain is the kind which exists between an emergent property and its infrastructure.

> Subjective experience in this interpretation is conceived to be an emergent dynamic property of cerebral excitation, inseparable from the material brain process, but different from and more than, the collected sum of the physicochemical components. (Sperry, 1969a, p. 230)

Emergent mental images and percepts typically have a subjectively experienced unity, continuity, and constancy markedly unlike the disparate, scattered and often spatially splintered and transformed neuronal events that generate the conscious experience. Early illustrations were given in reference to the neural events involved, for example, in perceiving a simple triangle.

> This approach does not lead us to expect in the cerebral process any kind of triangularity, linearity, nor even a unity corresponding to that of the perceived triangle.... When the fixation point shifts to either side, the fragments of the triangle projected to each hemisphere change accordingly. As the eyes rove over the triangle from apex to base and from side to side, the shape and also the position of the cortical patterns change radically in each hemisphere.

> While this kaleidoscopic series of excitatory changes is taking place in the visual cortex of the brain, the figure of subjective experience remains constant, a unified whole, with a fixed orientation in space...it is contended that unity in subjective experience does not derive from any kind of parallel unity in the brain processes. Conscious unity is conceived rather as ***a functional or operational derivative*** [emphasis added]...with nowhere a compact unified pattern of discharge that represents "triangle." (Sperry, 1952, pp. 300-307)

A similar argument was later used by Eccles (Popper and Eccles, 1977) as a key component of his hypothesis for dualistic psycho-neural interaction. In the present view, however, the difference between mental and neuronal is no greater than the difference between emergent properties and their components. The conscious experience is a property of, and cannot exist apart from, the cerebral substrate.

> In this holistic sense the present proposal may be said to place mind over matter, but not as any disembodied or supernatural agent. (Sperry, 1969b, p. 533)

> In arriving at an objective understanding of the mental phenomena it will be helpful to keep the subjective qualities in mind and not be misled into thinking of these emergents of neural events as being "nothing but" or "identical to" the neural events themselves. A neural event, or, preferably, a brain event or brain process, is many things: it includes the physiology of nerve-impulse traffic, the underlying chemistry, plus all sorts of subatomic low- and high-energy physical phenomena. While these may be the stuff of neural events, they are not, as I see it, the conscious phenomena. The latter are distinct causal properties that emerge only at upper levels of the brain hierarchy and with certain special types of cerebral events, unique as far as we know and yet to be discovered--hardly to be identified with what has heretofore been termed the neural events. (1976c, p. 175)

Subjective Conscious Qualities (Like Pain, Color, Sounds, Feeling Sad, Wanting to Shout, etc.) Play a Causal Control Role.

This central distinguishing tenet of the new mentalism has been held in the past to be in conflict with physical laws such as the conservation of energy, and directly contradictory to the centuries-old tenet of science that mind does not move matter. It is in direct conflict as well with behaviorism's decades-old denunciation of consciousness and of mentalist explanations. I first ventured to express this unorthodoxy at a 1958 Josiah Macy Conference.

> ...I find it difficult to believe that the sensations and other subjective experiences *per se* serve no function, have no operational value and no place in our working models of the brain....the pain *per se*, and subjective awareness in general, emerged in central nervous evolution and could only have been maintained and differentiated because it does serve a real use, i.e. by virtue of its operational value in the causal sequence. On these terms one wonders if any physiological model...that fails to include the subjective properties is not bound to end up with some kind of gap in the chain of cerebral events. (Sperry, 1959, pp. 420-421)

The evolutional argument, though frequently used today, is not in itself sufficient to refute the behaviorist/materialist position. Given an epiphenomenal or other parallelistic view of consciousness, for example (plus all the strengths of behaviorist philosophy and the doctrine of neuroscience and other natural sciences), it can be argued that it is the brain correlates that are the actual causal elements selected for in evolution, not the epiphenomenal subjective aspects which just get carried along incidentally.

The alternative claim that the conscious qualities themselves as subjectively experienced can exert causal control influence on the course of physical events in the brain still remained a brash, unacceptable concept from the standpoint of science when I first tried to spell it out more fully as "An Alternative Mentalist Position" (Sperry, 1965, p. 78).

> ...it comes down to the issue of who pushes whom around in the population of causal forces that occupy the cranium...of straightening out the peck-order hierarchy among intracranial control agents. Even the brain cells...do not have very much to say about when they are going to fire their messages, for example, or in what time pattern.... The firing orders for the day come from a higher command. In other words, the flow and the timing of impulse traffic through any brain cell, or even a nucleus of cells in the brain are governed largely by the over-all encompassing properties of the whole cerebral circuit system.... (Sperry, 1965, p. 79)

(The reference here and below is not to the whole circuit system of the <u>entire</u> brain, but only to that of the particular cerebral process for sustaining a given mental state or experience.)

> ...the dynamic properties of the cerebral system as a whole, and the way in which these properties direct and govern the flow of impulse traffic...may undergo radical and widespread changes from one moment to the next with just the flick of a cerebral facilitatory "set." This set is a shifting pattern of central excitation that will open or prime one group of circuit pathways with its own special pattern properties while at the same time closing, repressing, or inhibiting endless other circuit potentialities....
>
> ...if one keeps climbing upward in the chain of command within the brain, one finds at the very top those over-all organizational forces and dynamic properties of the large patterns of cerebral excitation that are correlated with mental states or psychic activity. (Sperry, 1965, p. 80)

> In the onward flow of conscious brain states, one state calling up the next, these are the kinds of dynamic entities that call the plays. It is exactly these encompassing mental forces that direct and govern the inner impulse traffic, including its electrochemical and biophysical aspects. (p. 82)

> These larger functional entities have their own dynamics in cerebral activity with their own qualities and properties.

They interact causally with one another at their own level as entities. (1969b, p. 534)

Top-down Causal Control

Referred to also as ***emergent determinism***, ***molar***, ***holistic***, or ***macro determinism***, ***downward causation***, ***emergent causation*** and, beginning in the 1970s, as ***"systems" thinking***, ***a "system's" view*** -- this revised concept of causal control is a critical key feature of the new mentalist paradigm, and often the feature that causes most misunderstanding. This is the feature also that stands most directly in contradiction with the orthodox bottom-up form of causality previously relied on in traditional materialism. In debates about the consciousness revolution we thus tend to focus eventually on the nature and role of downward causal determinism.

...a molecule in many respects is the master of its inner atoms and electrons. The latter are hauled and forced about in chemical interactions by the overall configurational properties of the molecule as a whole. (Sperry, 1964, p. 2)

The various atomic elements are "molecule-bound" -- that is, they are hauled and pushed around by the larger spatial and configurational forces of their encompassing molecules. (1965, p. 79)

But we had always been taught the converse, that things work the other way around, i.e., that the inner atoms of a molecule determine its properties and behavior in chemical reactions. This latter still continues to be the doctrine most commonly adhered to in present-day physics and chemistry. Our new view does not deny this but holds that in addition there are reciprocal emergent forces of the molecule as a whole that also exert concomitant control from above downward over the parts embedded at different levels within the structural hierarchy of the molecule.

Many physicists of the old persuasion protest that one can predict emergent properties such as the wetness of water from knowledge of the hydrogen and oxygen atoms alone in accord with the standard view that everything is determined from below upward following the course of evolution, and therefore that additional "emergent properties and forces" are not needed. This classic micro-

deterministic view of evolution and physical reality gets replaced in the new macro-mental reasoning by a different, upgraded picture:

> ...evolution keeps complicating the universe by adding new phenomena that have new properties and new forces and that are regulated by new scientific principles and new scientific laws...the old simple laws...never get lost or cancelled in the process of compounding the compounds. They do, however, get superseded, overwhelmed, and outclassed by the higher-level forces as these successively appear.... (Sperry, 1964, p. 2)

> At the top, in the human brain, these include the powers of perception, cognition, reason, judgment, and the like, the operational causal effects and forces of which are equally or more potent in brain dynamics than are the outclassed inner chemical forces. (p. 20)

The year following this publication Karl Popper in his "Clouds and Clocks" lecture gave up his previous view of evolutionary theory as being merely tautological in favor of much the same view expressed above, calling it "a new view of evolution" and "a different view of the world" as well as a new solution to the mind-body problem (Popper, 1972, 1978).

Different forms of "top-down" control are recognized in hierarchic theory. The particular type referred to here was illustrated by the example of how a wheel rolling downhill carries along its embedded molecules and atoms "regardless of whether the individual molecules and atoms happen to like it or not" (Sperry, 1969b). Charles Ripley points out that Bunge (1959, p.19) in his book Causality describes the same form of causation calling it "structural (or wholistic) determination: of the parts by the whole." The implications with respect to consciousness and reductive materialism, however, appear to have been missed, and instead of applying it in his later book on The Mind-Body Problem, Bunge (1980, p. 177) misinterprets and rejects outright the idea of "downward causation."

Downward determinism gained a strengthened scientific status in the early 1970s when mainstream psychology underwent a shift from behaviorism to mentalism, a shift for which downward determinism (of the mental over the neuronal) is a logical necessity. The cause for this turnaround by a whole scientific discipline (the

"consciousness/cognitive" revolution) is still in dispute, but clearly involved a large complex of factors: sociological, intuitive and wishful, as well as scientific and rational (Baars, 1986; Gardner, 1985; Sperry, 1987). Underneath it all, however, the new paradigm had to contain a challenging core concept that was both sound and also incompatible with prevailing behaviorist doctrine such that the behaviorist paradigm could not be stretched to encompass it (Cohen, 1985; Kuhn, 1970; Sperry, 1987). Otherwise, fervent adherents of behaviorism would quickly ferret out any vulnerability in the new concept or show behaviorism to be adequate to include it.

Top-down control of the parts by the emergent whole legitimizing consciousness and the subjective for science is such a core concept. Introducing a modified basis for causal explanation, it stands in direct conflict with the conventional exclusive microdeterministic premises that exclude consciousness and mentalist explanation -- not only in behaviorial science but also in neuroscience and in all basic science. Various subsidiary features of behaviorism had previously been contradicted, such as its "S-R" formulations (Miller, Galanter, and Pribram, 1960), linguistic theory (Chomsky, 1959; Lashley, 1951), reliance on learning theory and prenatal conditioning (Sperry, 1951), and others. But this was the first time that a counter conception had been found that could successfully refute the essence of behaviorism per se as a paradigmatic worldview and philosophy of science (Reese and Overton, 1972; Skinner, 1964). The new concept contradicted as well the microdeterminist paradigm of physical science in general.

Emergent determinism, the basic key concept behind this paradigm shift may be better understood perhaps when it is seen to involve a relativity factor and different reference frames. In the case of a molecule in the rolling wheel analogy, the molecule is governed in the usual physicochemical manner relative to events within the wheel. Relative to the rest of the world, however, the behavior of the molecule (its course through space and time and eventual fate) is determined much more prominently by the macro properties of the wheel as a whole. Thus, a neuroscientist working on events entirely within a conscious brain process need not deal with the emergent conscious properties. This becomes necessary only when describing the neuronal events relative to the rest of the world, or in reference to the organism beyond the given cerebral system.

We agree that by going back in time, retracing the course of evolution, one might obtain in principle a complete account by starting with some ultimate subatomic entity and/or energy. In the generation of successively higher emergent entities with increasingly larger and/or more complex parts, the parts themselves, however, once evolved, must all be treated holistically. After emergent properties have formed, a full causal understanding of events involving them requires inclusion of both the micro upward and the macro downward forms of determinism. Failure to include the latter is central to the centuries-old epistemological errors of the era of "scientific materialism."

A Unifying Middle-Way View

For understanding the mind-brain relation and associated problems, we had a choice in the past between mutually opposed explanatory frameworks: monism vs dualism, materialism vs mentalism, positivism vs epiphenomenalism or existentialism, and, in the "two cultures" of C. P. Snow: the value-free deterministic materialist descriptions of science versus the traditional humanistic (value-laden, purposeful) views of the rest of society (Jones, 1965). This choice as it stood in behavioral science was described by leading humanist Carl Rogers in reference to freedom and commitment in 1964:

The Irreconcilable Contradiction

> ...I have given two sharply divergent and irreconcilable contradictory points of view. On the one hand, modern psychological science, and many other forces in modern life as well, hold the view that man is unfree, that he is controlled, that words such as purpose, choice and commitment have no significant meaning.... Enormous strides have been and are being made in implementing this view.
>
> But over against this view of man...is the evidence from therapy, from subjective living, and from objective research as well, that personal freedom and responsibility have a crucial significance, that one cannot live a complete life without such personal freedom and responsibility....
>
> If in response to this you say, "But these views ***cannot*** both be true," my answer is, "This is a deep paradox with which we must learn to live. (Rogers, 1964, p. 40)

The two formerly conflicting and mutually exclusive approaches become reconciled in the present view within a single monistic hierarchy -- by treating mental states as non-reducible emergent properties of brain processing that exert sequential and downward causal influence, but have no independent existence of their own apart from the brain.

> ...note that the earlier basic distinction or dichotomy between mentalism and materialism is resolved in this interpretation...proposing instead a single unified system extending from subnuclear forces near the bottom up through ideas at the top. As a scientific theory of mind, it would provide a long sought unifying view on which to base our conception of human nature.... (Sperry, 1965, pp. 84-85)

> The present hypothesis represents a midway compromise between older extremes of mentalism on the one hand and materialism on the other. The present is mentalistic in accepting the existence of potent mental forces that transcend the material elements in cerebral function. It is materialistic in denying that these mental forces can exist apart from the brain process of which they are a direct property. (1969b, p. 534)

> ...a compromise...proposing a mutual mind-matter interaction in the upper realms of a single continuous hierarchy. (1970a, p. 590)

Such an intermediate "compromise" was initially rejected by Bindra (1970) as being a logical impossibility, but now has considerable acceptance (Lepore, Ptito, and Jasper, 1986; Natsoulas, 1987; Trevarthen, 1990).

Emergent 'Macro" Forces Throughout Nature Become Irreducible and Ineliminable Causal Constructs

Emergent/holist theory, following an initial strong upsurge in the 1920s and 1930s, underwent a tapering off and decline during the 1940s. By the late 1950s it had fallen into considerable disfavor in philosophy, psychology, and in biology (Feigl, 1967; Köhler, 1960; Lashley, Chow and Semmes, 1951; Simon, 1962; Sperry and Miner, 1955). After the mid 1960s emergent theory burst into another upsurge of new

interest (Koestler and Smythies, 1969; Bertalanffy, 1968; Polanyi, 1968a, 1968b) that still is strongly sustained.

This recent new lift can be ascribed to a combination of factors including especially: (a) a new approach and treatment within a different framework that emphasizes causality; (b) the application of emergent properties in a new solution for the mind-brain problem; (c) the infusion into emergent/holist and "systems" theory of downward causation; and (d) clarification of the irreducibility issue in terms of the complexity and causality of the spacing and timing (patterning) of component factors and of the inability of scientific laws for the component levels to cover these.

Prior approaches to emergence and holism had settled by the early 1960s into an unproductive stalemate over questions of the predictability of the novel properties of the whole from the parts, their derivability and accountability, along with related philosophic epistemologic issues. The new approach shifted the focus from how the emergent properties are formed to the causal consequences of their formation, making a major difference with respect to scientific explanation.

In the revised outlook the emergent properties are causally determined.

> ...I hold that every time the elements of creation, whether atoms or concepts, are put together in the same way under the same conditions, that the same new properties would emerge and that the emergent process is, therefore, causal and deterministic. To this extent and in this sense it may also be said to be, in principle, predictable though generally, with few exceptions, it is not so in practice. (Sperry, 1980, p. 200)

That emergent properties typically tend to be dramatically novel and rarely predictable is not because of any mystical unembodied forces (Smart, 1981), but because of the qualitative complexity of the causal factors, arising particularly in the spacing and timing relations of the parts, plus the lack as yet of scientific principles for the types of causality involved.

When it is stated that the parts determine the whole but that at the same time, the whole downwardly determines the action of the parts as, for example,

> The neurophysiology, in other words, controls the mental effects, and the mental properties in turn control the neurophysiology (Sperry, 1969b, p. 534),

such statements are not asserting a symmetric counterflow of causation, and do not constitute a contradiction. The interlevel upward and downward, doubly determinate, or reciprocal form of causation involves two very different types of causal determinism, both of which are in process simultaneously and without any conflict.

To sum in brief, the emergent whole is governed by scientific laws different from those that apply to the parts. The laws for the parts are inadequate to account for the whole because they fail to include the special spacio-temporal relations which are causative in themselves,and usually extremely complex and way beyond the three-body problem. We have no science for these crucial space-time factors. However, they are automatically included in practice all the time whenever laws are worked out for macro interactions at different levels in the different sciences.

It remains true in the mentalist model that the parts and their relations determine the properties of the whole, i.e., microdeterminism is not abandoned or replaced, just supplemented, or supervened. In general, the analytic reductive ***methodology and practice*** of science are not challenged, only the kinds of interpretations, philosophy and worldview traditionally inferred from science.

"Macro" Includes Mental, Both Conscious and Unconscious

The "macromental" paradigm is actually a micro-macro-mental model of causal determinism in which the microdeterminism is taken for granted and emphasis placed on the new macro and mental features. The mental, though only a subset of the macro, is sufficiently special in its importance and impact as to merit specific inclusion in the terminology.

The same reasoning by which conscious mental states become causal applies as well to unconscious mental states. The same holistic principles apply universally to hierarchically organized entities throughout nature at all levels: molecular, cellular, organismic, social and higher, and to inanimate as well as animate systems. The reasoning affirms the autonomy of the various different sciences at their own level and on the same grounds reinstates Newtonian physics

as a realm of science not overthrown by, nor subsumed under quantum mechanics. The same changed concept of causality negates the idea behind the "unity of the sciences" movement and also that behind a "theory of everything" discoverable at some ultimate subatomic level.

In the macromental view of causal determinism, humanistic and cognitive psychology acquire a previously lacking, long-sought of deterministic foundation. However, the commonly recognized methodological difficulties of working with the introspective mental qualitites remain substantially unchanged. Science overall acquires a new form of causal explanation, a new way of explaining ourselves and the world radically different from the previous reductive physicalist descriptions.

Issues of Terminology

Canadian philosopher Ripley (1984), in an extensive and penetrating critique, ascribes the frequent misinterpretation of my hypothesis to my "cavalier attitude to philosophical language" (p. 415) and "failure to recognize the need to redefine terms carefully" (p. 419). "What is really needed," Ripley writes, "is a careful and explicit redefinition of terms in the context of [this] theory" (p. 419). I have to agree and had something of the kind in mind in occasional references (e.g., Sperry, 1981) to "pre- and post-1965" science, philosophy, and terminology.

> It has been pointed out (Sperry, 1970b [1970a], 1976c [1976b]) that the theoretical and semantic distinctions that prevailed in philosophy prior to 1965 no longer hold in the same way in the context of current perspectives. (Sperry, 1977, p. 120)

Ripley himself favored the terms "monistic materialism" and "emergentist materialism" as most appropriate. Psychologist Thomas Natsoulas, specializing in the literature on consciousness, affirms that the theory combines features from previously opposed positions and selects "physical monism" and "monist interaction." At the other extreme, philosopher Mario Bunge (1980, p.3) describes my position as "dualism" but labels his own very similar version of it as "emergentist materialism."

Actually, the proposed concept of consciousness does, in effect, redescribe what mentalism means and also materialism and calls for

redefinitions of these concepts. On the other hand it leaves as conventionally defined the dualist-monist dichotomy except for added emphasis in the case of dualism on the independence of its two separate forms of existence. In particular, the distinction between embodied and unembodied mind and spirit becomes critical.

The label ***interactionist*** is used mostly in a broad sense depending on context to distinguish this mind-brain position from "noninteractionist" (i.e., epiphenomenal, double aspect and other parallelistic) solutions. Used only in a supervenient sense, the term does not imply an intervention by mental properties ***within*** the neurocellular chain of events at lower levels.

> The accepted biophysical laws for the generation and transmission of nerve impulses, for example, are in no way violated.... Although the mental properties in brain activity, as here conceived, do not directly intervene in neuronal physiology, they do ***super***vene. (Sperry, 1969b, p. 533)

The term ***emergent interaction*** or ***emergent causation*** implies firstly the causal action and interaction of emergent macro phenomena and properties at their respective macro levels as irreducible wholes. It also implies a concomitant downward supervenient control action on all lower-level components embedded in the interacting macro entities as has already been described. Causal interaction by mental or cognitive phenomena is an instance of the more general principle of emergent determinism.

Is it a "consciousness," "mentalist" or a "cognitive" revolution? The overthrow of behaviorism has been variously referred to as the "cognitive," "mentalist," "consciousness," "humanist" and "third force" revolution. The "cognitive" label tends to be favored, but it has been pointed out (Sperry, 1987) that in current usage cognitive may or may not imply consciousness and the subjective and accordingly is ambiguous as a title. While this is seen to be an advantage in some usages, as, for example, in "cognitive science" to cover both conscious and unconscious mentation as well as computer processes, it makes the term confusing in respect to the mentalist overthrow of behaviorism. If cognitive is used in a sense that does not imply conscious awareness, then the recent rise of cognitive science becomes more ***evolutionary*** than ***revolutionary*** (Bolles, 1990; Kendler, 1986, 1990).

> One can speak of the incremental rise of a new cognitive science on the one hand (Gardner, 1985), and on the other, of the revolutionary about-face in the scientific treatment of

> conscious experience. The two are related in many ways -- but to combine and mix the two without clear distinctions easily leads to unnecessary confusion. For similar reasons the term "mental" will be used here in preference to cognitive because mental more generally tends to connote processing in the living brain. (Sperry, 1987, p. 38)

What was genuinely revolutionary in the downfall of behaviorism is not any radical change in tenets respecting methodology, or specific issues such as nativism, language acquisition, S-R hypotheses, or the like. Nor was it the shift in regard to the general importance of cognitive factors in science. Cognitive, clinical and humanistic psychology had been around for decades. What was truly revolutionary is the radical turnabout in the scientific status and treatment of consciousness and the subjective. This latter is what was fundamentally incompatible with the essence of behaviorism as a philosophy of science, and as a paradigm making psychology consistent with neuroscience and the other natural sciences (Reese and Overton, 1972). Accordingly the terms "consciousness" or "mentalist," more accurately than "cognitive," describe the revolutionary overturn of behaviorism and the resultant spreading challenge this now poses to microdeterminism throughout the rest of science.

Is it "mentalism" or "emergentist materialism?" This and other terminology is not fixed and the choice depends a lot on one's perspective and background. With all the pros and cons considered, I continue to favor the new ***mentalist*** terminology over a new revised and relabeled version of ***materialism***. It better emphasizes the major turnabout in the scientific treatment of mind and consciousness. It also is in better accord with the common terminology of behavioral science. Further reasons why I do not try to squeeze the new recognition of conscious mind within the old materialist paradigm are reviewed in a recent analysis of the consciousness revolution (Sperry, 1987).

A revolution for all science? Subsequent spread of the top-down, emergent control principles beyond psychology into the human and social sciences, systems theory, evolutionary theory, computer science, biology, hierarchy philosophy and other disciplines including even physics (via chaos and computer science) gives strong reason to think that science as a whole may be in the process of shifting away from its centuries-old microdeterminate materialist paradigm to a more

valid macromental model for causal explanation and understanding. In this context compelling reasons can be seen to emphasize, rather than de-emphasize this change: that science now describes a radically revised picture of the conscious self, physical reality, and the kinds of forces in control, that it has a new story to tell with a whole new set of answers to the question "What does science leave to believe in?"

To degrade the meaning of the mental now in this new treatment by saying that it is just a revised form of materialism, that mind is matter, that the subjective forces and qualities are just aspects of physics, that a person is "nothing but a very complicated physical mechanism" (Smart, 1981, p. 109), has seemed less preferable than retaining the conventional empiric mind-matter distinction. If science and philosophy have made a two-centuries-old error in maintaining that "the behavior of the brain is determined solely by the physical laws that apply to the innumerable physical particles..." (Smart, 1981, p. 109), it seems questionable to now try to save the materialist doctrine by re-labelling materialism as "emergent" or "nonreductive" and redefining ***mind*** as a form of ***matter***. Retention of the monist-dualist and mind-matter conventions still seems a better solution.

Resolution of the Freewill-Determinism Paradox

The described macromental position brings also a new approach and solution to one of the most refractory and paradoxical of all problems for both science and philosophy, the issue of free-will versus determinism. Again the older concepts are combined in a new middle-way synthesis, retaining both polar conditions, but in a revised form (Deci, 1980; Grenander, 1983). Determinism is retained but the antecedent causal determinants of willed actions -- no longer merely physicochemical -- include subjective mental choice to take whatever alternative possible course one prefers, along with the ability to alter this decision at the last instant. In the causal interplay of antecedent events leading to a willed choice, the irreducible mental forces and their organizational dynamics supersede the physicochemical determinacy of traditional reductive physicalism.

> It should be clear that the kind of determinism proposed is not that of the atomic, molecular, or cellular level, but rather the kind that prevails at the level of cerebral mentation,

> involving the interplay of ideas, reasoning processes, judgment, emotion, insight, and so forth. (Sperry, 1966, p. 5)

> By bringing subjective phenomena into the causal sequence of the cerebral decision-making machinery, additional degrees and kinds of freedom are introduced that are not evident where the brain process is conceived merely in terms of electrochemical and neurophysiological determinants. (1970a, p. 590)

Retention of both free-will and determinism is not contradictory because free will is defined to mean, not freedom from *all* causation but degrees of freedom to do whatever one's subjective inclinations may lead to. Cosmic fatalism still applies but depends on whether the universe is a closed or open system. Surely the more confined "world we live in" is not closed, and always subject to unpredictable surprise. A main point we come back to is that: offered a choice between a causally determined existence and one that is not causally determined (and therefore chaotically unreliable, unpredictable, and without reason or meaning), we would all prefer to live in a causally determined universe, especially given now the new macromental form of determinism.

> The proposed brain model provides in large measure the mental forces and abilities to determine one's own actions. It provides a high degree of freedom from outside forces as well as mastery over the inner molecular and atomic forces. In other words it provides plenty of free will provided we think of free will as self-determination. (Sperry, 1966, p. 5)

> The answer here is that complete freedom from causation would mean behavior based purely on chance, on caprice, and would result in meaningless chaos. What one wants of free will is not to be totally freed from causation but, rather, to have the kind of control that allows one to determine one's own actions according to one's own wishes, one's own judgment, perspective, cognitive aims, emotional desires, and other mental inclinations. This, of course, is exactly what is provided in our current interpretation. (1976a, p. 15)

Science-Values Dichotomy is Turned Around

The turnabout on the causal status of consciousness in science effects a turnaround in the traditional relation of science to values. Though the value implications were intensely disputed at first, it is now widely agreed that we have entered a new era with respect to the importance of values and of ethico-moral thinking generally since the mid 1970s (Edel, 1980). Not only is a descriptive science of values now possible, but also it becomes feasible to derive values from the worldview of science in a *pre*scriptive sense (Rottschaefer, 1987; Sperry, 1965, 1972, 1983).

This outcome follows because of the combined effects of two major changes. The first of these is a turnabout in the scientific (causal, explanatory) status of subjective experience, including subjective values.

> Subjective values, for example, and value judgments become objective causal factors in the global chain of control, their origins, structure, and function no longer out of bounds to science on philosophical or other grounds. (Sperry, 1970a, p. 590)

> Viewed objectively as top-level causal agents in our global-control system, human values have become too important to be treated, as in the past, simply by neglect or by a laissez-faire or even "hands-off" policy. (1972, p. 118)

Human values in this mentalist model, instead of being viewed as ineffectual epiphenoma, become the most critically powerful collective force shaping the course of events in the civilized world -- and thus an underlying key to current global ills and to world change.

> ...an extraterrestrial troubleshooter...very quickly would put his finger on...the human value factor in our biospheric controls as the primary underlying cause of most of our difficulties. (Sperry, 1972, p. 116)

> In essence, what a person or a society values determines what it does. The human value factor, defined in this way and viewed objectively in terms of brain states that govern acts, thoughts, and decisions, may be seen to occupy a central

> position of strategic regulative influence in the total biospheric scheme of command. (1972, p. 117)
>
> ...it seems important that the social value factor be more generally recognized as a powerful causal agent in its own right and something to be dealt with directly as such. No more critical task can be projected for the 1970s than that of seeking for civilized society a new, elevated set of value guidelines more suited to man's expanding numbers and new powers over nature, a frame of reference for value priorities that will act to secure and conserve our world instead of destroying it. (1972, p. 119)

The second major change affecting the science-values relation is the transformation of the scientific world picture to include the causal reality of the emergent, richly varied macro qualities of both human and nonhuman nature, and which no longer are considered to be reducible to subatomic physics. Instead of destroying values with a cosmos composed and moved only by mindless elemental physical forces, the new science says that the world we live in is full of all kinds of holistic macro entities, forces, and qualities of irreducible meaning and value. In our new outlook our world is driven, not only by quantum mechanics but more prominently and crucially by these higher, more evolved, emergent macro forces. The vital and mental forces of life, mind and society (many purposeful and caring) become just as legitimate causal realities for scientific explanation as are molecular and atomic forces.

> But to return to the central concern of this essay -- the impact of creeping materialism in the brain-behavior sciences -- we can say in summary that it is possible to see today an objective, explanatory model of brain function that neither contradicts nor degrades but rather affirms age-old humanist values, ideals, and meaning in human endeavor. The noble, free, or...sublime qualities...are present in our model, much as history and common experience have always shown. (Sperry, 1965, p. 92)
>
> Many prior antiscience objections to the mixing of science and values no longer apply. A holistic world model and interpretation of reality is also supported in which the

> qualitiative pattern properties of all entities are conceived to be just as real and causally potent as are the properties of their elements or their quantitative measurements and abstractions. This preservation of the qualitative value and pluralistic richness of physical reality stands counter to the common tendency...to correlate science with reductionism. (1977, p. 240)

> If the micro-determinists are correct...then we live in a cosmos driven entirely by physical forces of the most elemental kind, that is, quantum mechanics, the four fundamental forces of physics.... These are the forces that are in control, the forces that made and move the universe and created man...there is no higher meaning, no values, no purpose, no choice, nor any spirituality or moral priority.
>
> On the other hand, if we are correct about macro-determination, or "emergent determinism," these lower-level physical forces, though still active, are successively enveloped, overwhelmed, and superseded by the emergent forces of higher and higher levels....
>
> Organic evolution becomes a gradual emergence of increased directedness or purposefulness and meaning among the forces and properties that move and govern living things. Scientific descriptions are no longer in utter conflict with traditional humanist views and values or the search for meaning. (1986, p. 269)

The complete turnaround from a value-empty to a value-rich description of reality and from a noncausal to a causally interactive conception of human values (a shift from impotent epiphenoma to being the most powerful key force shaping events in the civilized world) makes the consciousness revolution, in effect, also a "values" revolution.

Ethics From Science

Human ethics and morality throughout history have been consistently tied to an ultimate respect and reverence for the forces that created and control the universe. Of the thousands of variations in which these creative forces have been conceived by different cultures through history, there is strong reason to believe that

modern science in many respects provides by far the most advanced insights and valid understanding of the real nature of these ruling forces and of reality itself from submicroscopic levels to galactic clusters.

What we value depends on what we believe, and what we believe about ourselves and the universe has come to depend very much on science. The shift from otherworldly and afterlife reference frames to the credibility of the empirically verifiable, brings a changed sense of ultimate value focused in this-world reality and evolving nature. The physically driven, value-empty cosmos previously described by science has always been incompatible with ethico-moral choice. However, with stark reductive physicalism now replaced by the new mentalist outlook including emergent macro as well as mental controls, the worldview of science becomes compatible for the first time with ethics and morality.

> Changing to an ethic based in science would entail in large part a substitution of the natural cosmos of science for the different mythological, intuitive, mystical, or "other-worldly" frames of reference.... (Sperry, 1977, p. 243)

Humanity's creator becomes accordingly the vast interwoven fabric of all evolving nature, with creation and the creative forces inseparably interfused. What is done to one, affects the other. Evolving nature (including human nature and sociocultural development) sets the framework by which ultimate meaning, moral right and wrong, and so on are determined. The highest good becomes the preservation and further enhancement of an ever-evolving quality of existence. An open continuing future becomes essential. Otherwise, in the absence of otherworldly alternatives, the entire human enterprise with everything it means, developed over eons, is lost in oblivion and cosmic meaninglessness.

Worsening world conditions with the growing threat of extinction make survival (or better, ***quality*** survival) the prime overwhelming moral imperative of our times. Environmentalism, population controls, conservation, and other policies that will help sustain the evolving quality of life for future generations acquire accordingly on the above terms an ultimate ethical and moral basis.

> The grand design of nature...including the forces that move the universe and created man, with special focus on evolution in our own biosphere, is something intrinsically good that it is right to preserve and enhance, and wrong to destroy or degrade. (Sperry, 1972, p. 127)

> Reverence for the cosmic forces that control the universe and created man is retained in full; only the definition and conception are modified to conform with modern evidence.... Prevention of environmental pollution and ravishment of the ecosystem, for example, becomes more than a mere expedient for human benefit. The ultimate meaning and purpose of all life are at stake, and a corresponding conviction, conscience, and dedication come to reinforce the effort. (1972, pp. 128-129)

> A science-based moral code emerges in which the most valued things in life are neither relegated to another realm of existence nor reduced to quantum physics. ...as with any ethical code, the final criteria are determined only in broad principle, and much is left for argument in regard to specific issues. (1988, p. 611)

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